

What is claimed is:

1. A method for providing an early warning of thermal decay, comprising:
writing a test pattern to a magnetic disk, wherein said test pattern comprises at
least one of a higher data density than a data density of user data and a location on said
magnetic disk having a greater than average susceptibility to thermal decay;
5 measuring an amplitude of a signal produced by reading said test pattern;
storing said measured amplitude;
reading said test pattern to obtain an observed amplitude of a signal produced by
said test signal;
comparing said measured amplitude to said observed amplitude; and
10 producing a thermal decay warning signal if said comparison is unfavorable.
2. The method of Claim 1, wherein said step of writing a test pattern
comprises writing information to at least a first track of said magnetic disk at a first
frequency, wherein said first frequency is higher than a nominal data frequency for said
track.
3. The method of Claim 2, wherein said at least a first track is located within
a first zone, wherein said first frequency is a nominal data frequency for a second zone,
and wherein said first zone is located towards an inside diameter of said magnetic disk
relative to said second zone.

4. The method of Claim 1, further comprising identifying a sector of said magnetic disk at which a magnetic medium comprising an information storing portion of said magnetic disk is thinner than an average magnetic medium thickness of said magnetic disk, wherein at least a portion of said test pattern is written to said identified sector.

5. The method of Claim 4, wherein said sector is identified by measuring the amplitude of signals produced by a plurality of automatic gain control fields, and wherein said identified sector is associated with a one of said automatic gain control fields producing an amplitude that is less than a nominal automatic gain control field amplitude.

6. The method of Claim 1, further comprising, in response to said thermal decay warning signal, refreshing data stored on at least a portion of said magnetic disk.

7. The method of Claim 1, wherein a test pattern is written to each data storage surface of each magnetic disk included in a hard disk drive.

8. The method of Claim 1, wherein said steps of reading said test pattern to obtain an observed amplitude of said test signal, comparing said measured amplitude to said observed amplitude, and producing a thermal decay warning signal if said comparison is unfavorable are performed periodically.

9. The method of Claim 1, wherein a portion of said magnetic disk having a greater than average susceptibility to thermal decay is created during manufacture of said magnetic disk, and wherein said test pattern is written to said portion of said magnetic disk.

10. The method of Claim 1, wherein said test pattern is written in accordance with a longitudinal recording scheme.

11. A method for providing an early warning of thermal decay, comprising:
writing a test pattern to a magnetic disk, wherein said test pattern comprises at
least one of a lower data density than a data density of user data and a location on said
magnetic disk having a greater than average susceptibility to thermal decay;
5 measuring an amplitude of a signal produced by reading said test pattern;
storing said measured amplitude;
reading said test pattern to obtain an observed amplitude of a signal produced by
said test signal;
comparing said measured amplitude to said observed amplitude; and
10 producing a thermal decay warning signal if said comparison is unfavorable.

12. The method of Claim 11, wherein said step of writing a test pattern
comprises writing information to at least a first track of said magnetic disk at a first
frequency, wherein said first frequency is lower than a nominal data frequency for said
track.

13. The method of Claim 12, wherein said at least a first track is located
within a first zone, wherein said first frequency is a nominal data frequency for a second
zone, and wherein said first zone is located towards an outside diameter of said magnetic
disk relative to said second zone.

14. The method of Claim 11, further comprising identifying a sector of said magnetic disk at which a magnetic medium comprising an information storing portion of said magnetic disk is thinner than an average magnetic medium thickness of said magnetic disk, wherein at least a portion of said test pattern is written to said identified sector.

15. The method of Claim 14, wherein said sector is identified by measuring the amplitude of signals produced by a plurality of automatic gain control fields, and wherein said identified sector is associated with a one of said automatic gain control fields producing an amplitude that is less than a nominal automatic gain control field amplitude.

16. The method of Claim 11, further comprising, in response to said thermal decay warning signal, refreshing data stored on at least a portion of said magnetic disk.

17. The method of Claim 11, wherein a test pattern is written to each data storage surface of each magnetic disk included in a hard disk drive.

18. The method of Claim 11, wherein said steps of reading said test pattern to obtain an observed amplitude of said test signal, comparing said measured amplitude to said observed amplitude, and producing a thermal decay warning signal if said

comparison is unfavorable are performed periodically.

19. The method of Claim 11, wherein a portion of said magnetic disk having a greater than average susceptibility to thermal decay is created during manufacture of said magnetic disk, and wherein said test pattern is written to said portion of said magnetic disk.

20. The method of Claim 11, wherein said test pattern is written in accordance with a perpendicular recording scheme.

21. A method for detecting thermal decay in a hard disk drive, comprising:
identifying a sector of a magnetic disk having a magnetization that is less than an
average magnetization for said magnetic disk;
writing an early warning pattern to said sector;
5 reading an amplitude of said early warning pattern to obtain a reference
amplitude;
storing said reference amplitude;
reading an amplitude of said early warning pattern to obtain an observed
amplitude;
10 producing a thermal decay warning signal if said observed amplitude is less than
said reference amplitude by more than a predetermined amount.

22. The method of Claim 21, wherein said sector is identified by observing an
amplitude of a selected type of servo sector information written to said disk, wherein said
15 identified sector is a sector associated with a one of said selected type of servo sector
information having an amplitude that is at least about 10% less than an average amplitude
of said selected type of servo sector information.

23. The method of Claim 22, wherein said servo sector information comprises
automatic gain control information.

24. The method of Claim 21, wherein said step of identifying a sector of a magnetic disk having a magnetization that is less than an average magnetization for said magnetic disk comprises identifying an area of said disk having a magnetic media thickness that is less than an average magnetic media thickness of said magnetic disk, wherein said identified sector is a sector located in said identified area.

25. The method of Claim 21, further comprising producing an area of said magnetic disk having a magnetic media thickness that is less than an average magnetic media thickness of said magnetic disk, wherein said step of identifying a sector of a magnetic disk having a magnetization that is less than an average magnetization for said magnetic disk comprises identifying at least a first sector that is at least partially located within said area having a less than average magnetic media thickness.

26. The method of Claim 25, wherein said hard disk drive stores data according to a longitudinal recording scheme, and wherein said area having a less than average magnetic media thickness is located towards an inner diameter of said magnetic disk.

27. The method of Claim 25, wherein said disk drive stores data according to a perpendicular recording scheme, and wherein said area having a less than average media thickness is located towards an outer diameter of said magnetic disk.

28. The method of Claim 21, wherein said hard disk drive stores data according to a longitudinal recording scheme, and wherein said step of writing an early warning pattern comprises writing data to said identified sector of said magnetic disk at a frequency greater than a nominal data frequency for data stored on a track comprising said identified sector.

29. The method of Claim 21, wherein said disk drive stores data according to a perpendicular recording scheme, and wherein said step of writing an early warning pattern comprises writing data to said identified sector of said magnetic disk at a frequency less than a nominal data frequency for data stored on a track comprising said identified sector.

T 06.09.01 5:42:50

30. A method of detecting thermal decay in a magnetic storage device,
comprising:
writing a test pattern having a greater susceptibility to thermal decay than a 1 T
pattern to a magnetic storage medium;
5 reading an amplitude of a signal produced by said test pattern to obtain a reference
amplitude;
storing said reference amplitude;
reading an amplitude of a signal produced by said test pattern to obtain an
observed amplitude;
10 comparing said reference amplitude to said observed amplitude; and
in response to an unfavorable comparison, producing a thermal decay warning
signal.

31. The method of Claim 30, further comprising:
writing a first evaluation test pattern to said magnetic storage medium;
writing a second evaluation test pattern to said magnetic storage medium, wherein
said test pattern is selected from at least said first and second evaluation test patterns.

32. The method of Claim 30, further comprising identifying a portion of said
magnetic storage medium having a susceptibility to thermal decay that is greater than an
average susceptibility to decay of said magnetic storage medium.

thickness that is less than a prescribed amount.

38. The hard disk drive of Claim 37, wherein said prescribed amount comprises a thickness that is less than about 90% of an average thickness of said magnetic storage material.

39. The hard disk drive of Claim 37, wherein said magnetic storage disk is formed having a magnetic storage material thickness that is intentionally reduced in said area of said magnetic storage disk having a magnetic storage material thickness that is less than a prescribed amount.

40. The hard disk drive of Claim 36, wherein said first test pattern is written to an area of said magnetic disk having an increased probability that magnetic domains included in said area will return to a direction occupied by said magnetic domain prior to being written with said at least a first test pattern.

41. The hard disk drive of Claim 36, wherein said hard disk drive stores data using a longitudinal recording scheme, wherein said at least a first of said data tracks is located in a first zone, wherein said data frequency of said at least a first test pattern corresponds to a data frequency for user data located in a second zone, and wherein said second zone is located farther from an interior diameter of said magnetic storage disk

46. The hard disk drive of Claim 36, wherein said hard disk drive stores data using a perpendicular recording scheme, and wherein said at least a first test pattern comprises a 24T pattern or greater.

53. The hard disk drive of Claim 47, wherein said hard disk drive stores data according to a perpendicular recording scheme, and wherein said at least a first test pattern comprises a 12T or greater pattern.